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A combination of a progress report and a technical report, this paper should prove useful as an aid in planning future research, and should prove generally useful to those interested in communication processes by means of sound films, as well as to those who work in the areas of radio and television. Effectively there are two halves to the paper. The first half is classified into five parts, in terms of learning principles, of some areas for research on instructional films; and the second part, the appendix, comprises a summary of the experimental projects of the Instructional Film Research Program in relation to the foregoing classification which, specifically, is: 1. Psychological learning principles and their relationship to learning from films. 2. Film characteristics and their effect on learning. 3. Development of new equipment and procedures for testing instructional films. 4. Research on methods for utilizing films in instruction; and 5. Reviews of pertinent literature and theoretical systems. A skeleton classification of some areas for research on instructional films, which folds out for easy reference, is appended. (GO)

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PROGRESS REPORT NO. 11-12

INSTRUCTIONAL FILM RESEARCH PROGRAM

PERIOD: 1 March to 30 June 1949

Pennsylvania State College
School of Education

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FOREWORD

Progress Report No. 11-12 combines two bi-monthly reports, according to agreements with Special Devices Center, and covers the period 1 March 1949 through 30 June 1949. This document is also a combination of a progress report and a technical report in that the section on *A Classification in Terms of Learning Theories of Some Areas for Research on Instructional Films* is the result of Project Number 5. Finally, from one viewpoint, this is a general report covering almost two years of work of the Instructional Film Research Program. The section on *General Summary of Trends of Results* deals with broad perspectives, and also summaries of many projects are given within the framework of a system of learning theory.

This report should be useful not only for reviewing the work of the Instructional Film Research Program but also as an aid in the planning of future research. Furthermore, the mapping of trends of results and areas of research should assist those who are investigating communication processes by means of sound films, as well as those who are working in the areas of radio and television.

C. R. CARPENTER, Director
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NUMBER, TITLE, STATUS AND PROGRESS OF RESEARCH PROJECTS

Project No.	Title	% Completed*	% Increase Since 31 December
1	Exploratory Study of Educational Films	cancelled	
2	Film Analyzer Equipment	100	5
3	Group Instruction and Test System (The Classroom Communicator)	99	1
4	Critical Evaluation and Summary of Experimental Literature on Instructional Films	95	15
5	Critical Evaluation and Summary of Learning Theories in Psychology and Education Pertinent to Instructional Motion Pictures	100	50
6	Relative Effectiveness of Color and Black-and-White in Instructional Films	100	10
7	Musical Backgrounds in Instructional Films	95	10
8	Annotated Bibliography on Effectiveness of Music in Instructional Films	100	0
9	Distributed versus Massed Film Presentations	100	15
10	Effects on Training of Experimental Film Variables, Study I: Verbalization, Rate of Development, Nomenclature, Errors, "How-It-Works," Repetition.	100	15
11	Design of a General Model for Testing Instructional Films	cancelled	
12	Relationship of Length, Fact Frequency, and Difficulty, to Effectiveness of Instructional Motion Pictures	75	20
13	Effects of Inserted Questions and Statements on Film Learning	100	25
14	Effects of Learner Representation in Instructional Films	100	25

* Percentage completed exclusive of the final report.

15	Relative Effectiveness of Instruction by: Films Exclusively, Films plus Study Guides, and Standard Lecture Methods	100	45
16	Filmic Illustrations of Selected Learning Principles Applicable in Instructional Films	30	5
17	Contributions of Varied Film Introductions and Summaries to Learning from Instructional Films	100	70
18	Research Literature on Film Commentaries	100	0
19	Commentary Variations: Phase Relations, Level of Verbalization, and Learner-Reference in Instructional Films on Perceptual-Motor Tasks	100	40
20	Effectiveness of Three-Dimensional Instructional Sound Motion Pictures for Perceptual-Motor Skills	50	20
21	Characteristics of Subjects in Relation to Film Learning Gains	65	30
22	Attention-Gaining Devices in Films	50	30
23	Physiological Indicators of Subjects' Involvements during Learning	100	75
24	Effects of Repetitive Film Presentations on the Rate and Amount of Learning	90	70
25	Investigation of the Effects of Prestige Factors on Learning from Sound Films	50	30
26	Development of Procedures for Pre-Release Testing of Instructional Films	25	5
27	Development of Procedures for Constructing Temporal Profiles of Learning from Instructional Films	30	15
28	Comparisons of Learning from "Dramatic" and "Factual" Films	25	15
29	Relative Effect on Learning of Showing Right or Right-Wrong Methods in Film Presentations of Conceptual Learning and Perceptual-Motor Tasks	10	0

30	Practice Effects in Film Learning	50	40
31	A Report on Instructional Film Research, Production, and Utilization in Great Britain, Canada, and Australia	100	50
32	Relative Contributions to Learning of Video and Audio Elements in Films	60	50
33	Employment of Sound Films for Restructuring Attitudes	35	20
34	Experiments on Functional Characteristics of the Classroom Communicator	10	0
35	The Effects of Authentic Sounds in Instructional Films	50	40
36	Effects on Learning of "Shock Sequences" in Sound Films	5	0
37	A Theoretical System, and Other Requirements, for Research in "Mass Media" (Sound Films, Radio and Television)	20	10
38	Procedural Requirements for Audience-Controlled Film Flexibility for Rapid and Complete Learning at Multiple Levels	5	0
39	Development of a Printing Device for The Classroom Communicator	30	15
40	Development and Evaluation of a Flexible Device for Individual Film Study	10	5
41	Development of a Flexible Multiple-Channel Magnetic Film Recording and Reproducing System for Research and Instruction	5	0
42	Development of Experimental Equipment, and Evaluation of Monaural and Binaural Sound Integrated with Pictorial Fields in Instructional Films	5	2
43	Development and Testing of Procedures for Infra-Red Photographic Recording of Audience Reactions	10	7
44	Effects on Training of Experimental Film Variables, Study II: "How-It-Works," Verbalization, Participation, Succinct Treatment	60	45
45	Summary Report on Instructional Film Research, Production, and Utilization in the United States	30	5

GENERAL SUMMARY OF TRENDS OF RESULTS: THE INSTRUCTIONAL FILM RESEARCH PROGRAM 1947-1949

C. R. CARPENTER, Director
Instructional Film Research Program

I. INTRODUCTION

Two years have passed since the beginning of the Pennsylvania State College Instructional Film Research Program. During this, the initial phase of research, many thousands of man-hours have been invested in film research, a relatively large sum of money has been spent and approximately 15,000 subjects have been used in experiments. The general objectives of the Program have been kept in constant focus, namely, to accomplish research results on the basis of which facts can be stated and principles formulated for governing the production and utilization of sound motion pictures as a means of rapidly and effectively instructing and training large numbers of people.

An appropriate question is: Generally, what has been accomplished? Another related question is: Specifically, what results have been found, and what are the levels of confidence in these findings? The full answer to this second question will be found in published and forthcoming final technical reports. It is the intent of this summary to give general findings and trends of thought relative to film production, utilization and research. Many of the problems are still in the process of being investigated. Indeed, the generalizations stated here will require extensive future research to establish them definitely, to delimit them properly, and to ascertain the level of confidence with which they can be held.

It is the present conviction of those who have worked with the Instructional Film Research Program that systematic theories of learning, perception, and attitude formation constitute the proper framework of orientation for instructional film research and that rigorous scientific research based on these theories requires the production of special experimental films. This approach would seem to be more fruitful than others which are oriented in terms of panels of experts, audience "likes" and "dislikes," "principles of art appreciation," and analyses of specific "factors" found in existing instructional films.

Once this position is assumed, the task may be divided into two parts: 1. The application of existing statements of learning theories, principles, and facts, to the dynamic medium of the sound motion picture. In this respect it is clearly recognized that learning theories have not been formulated originally on the basis of experiments in which the tasks and procedures are the same as those involved in learning from complex sound motion pictures. The present need is to learn exactly the degree to which known perceptual and learning principles apply to this special medium of instruction and communication. When this is known, due correction can be made, if necessary, by reformulating these principles. 2. The formulation of new learning principles or generalizations which apply in the use of the complex media of communication: films, radio, and television. It may be well to assume that by doing research in these areas new data may be collected which will form the basis for establishing new learning principles.

Thus, regardless of modifications and exceptions, it is strongly contended that the testing of existing principles of motivation, perception and learning offer the best conceivable approaches and orientations for research on instructional and informational sound motion pictures.

II. TRENDS OF THOUGHT SUGGESTED BY RESEARCH RESULTS

A. Film Production Procedures

1. Pre-production testing. Those associated with the Instructional Film Research Program during the past two years have been developing the following convictions about procedures for instructional film production: a. The instructional or training objectives for films should be stated explicitly prior to preparation of film "treatments," "story boards" or scripts. b. In order to build into a film the proper content, and have it properly presented, both subject-matter specialists (technical advisors) and instructional specialists (educational or psychological advisors) are needed to work closely with motion picture producers at each phase of production. c. Pre-production testing of instructional films can and should be done. This pre-production testing should seek to measure approximately the degree to which the film will achieve the realistic instructional objectives, as originally stated, or as modified for the final release. Pre-production tests can be made which are appropriate to the film treatment, the script, the story board sketches (in form of test film strips with recorded commentary), and the rough cuts of the production. All tests should be given to sample populations which are very similar to the trainee populations for which the film is intended. Finally, before being released and distributed for use, the film should be tested and evaluated objectively in terms of its actual instructional performance standards. Exact statements of these performance standards should be supplied with the films to those who use the film for training purposes, and the conditions of use should be defined in order to obtain the expected performance level.

2. Film production and audience characteristics. It is held to be a certainty that for the production of effective instructional films, specific and relatively complete information on the personal and intellectual characteristics of the film's target-audience should be available to and used by the technical and educational advisors, the writers, directors, and editors who help produce the film. Such characteristics of the intended audience as the following should be known: educational or intelligence level, level of maturity, previous knowledge and training in the subject matter of the film, patterns of related general and specific interests, probable level of motivation to learn from the film, probable need for information contained in the film, point in the training program when the information given by the film will be used, degree of verbal comprehension, level of effective knowledge of technical terms and concepts, etc. Only by knowing these, and other facts about the training audience can those responsible for film production apply intelligently the principles of learning.

3. Limiting range of film objectives. It is becoming increasingly clear that general films, i.e. films which either cover a wide range of subject matter or "angled" for a wide audience (e.g. many educational levels) or both of these,

have of necessity low instructional efficacy. By contrast, films which aim limited subject matter at a specific trainee population of known characteristics are likely to be most effective.

4. Film variables: rate of development. Evidence is accumulating to support the view that the rate of development of currently produced training films is generally too fast for the instruction of intended populations of trainees. Present day pacing of informational films seems to be most appropriate to the dramatic or entertainment type films. Indications are that pacing should be varied to suit differences in the audiences' intelligence, educational levels, and their amounts of previous knowledge of the specific and related subject matters treated in the film. Pacing should also be varied to suit the difficulty of the subject matter itself.

5. Film variables: showing of errors. A perennial question for debate has been that of whether or not "errors to be avoided" should be shown in training films. At present, available evidence indicates that likely errors in performance should be shown carefully and clearly in teaching perceptual-motor skills. As yet it is not known whether or not this finding can be generalized and extended to the teaching of more complex perceptual and conceptual skills.

6. Film variables: camera angle. One unequivocal finding which has emerged concerns relative merits of various camera angles or viewpoints of presentation: In showing performance skills it is clear that for effective instruction the task should be shown in the motion picture and described in the commentary in such a manner as to present as nearly as possible the view (visual, kinesthetic, auditory, etc.) which will be had by the trainee in the actual performance of the task being learned.

7. Film variables: relation of picture-commentary. Picture-commentary relations have engaged the attention of those working on the Instructional Film Research Program. In a large majority of films the "idea" or "concept" burden of the sound film is communicated principally through the commentary. All too often the picture merely serves as a backdrop for the tightly packed narration. Generally the full potentialities of both the picture and the commentary, closely integrated for full impact, are not completely developed. Several aspects of picture-commentary relations have now been investigated:

a. Level of verbalization. Studies of commentary variables tend to show that: 1. It is possible to use too many as well as too few words in the commentary of sound motion pictures. There is an optimal level for the amount and kind of verbal explanation and this level should be determined by tests for each type of film, with due regard for the subject matter of the film and the intended audience. In this respect attention should also be given to the degree of difficulty of the vocabulary used, to ensure that it is within the range of comprehension of the intended audience.

b. Phase relations. During research on picture-commentary relations, a problem has arisen which deserves close attention: namely, the time-phase relation of picture and verbal cues. Depending on where the significant directional cues for learning lie, i.e. in the picture or in the commentary, either one or the other should lead and hence initially alert the learner to the intended points or to crucial steps in a performance. In other cases exact synchronization of visual and auditory cues may be desirable. No clear-cut trend of thought on this problem has yet been formulated. However, it is tentatively assumed that for maximum effectiveness the pictures and verbal commentary should be integrated to that degree which is best for effective learning, and to do this, leading or lagging phase relations other than exact synchronization may be desirable.

c. Form of address. The forms of address used in films, i.e. 1st person, 2nd person, 3rd person, and imperative, have some effect on the instructional results of films. For military service personnel who are being indoctrinated, the imperative form of address seems to be most effective in giving instructional directions. Least effective is the third person passive which is commonly used in commentaries for films.

8. Film variables: black-and-white versus color. Should training films be produced in black-and-white or color? There are preliminary findings on this debatable question. In terms of amounts of resultant learning little differences are thus far revealed between films on the same subjects shown in color and in black-and-white. Except in subjects where color supplies crucial and determining cues for learning, there seems to be slight justification for using color to improve the instructional efficacy of motion pictures. Extension of research is planned in this, as well as most other areas mentioned in this summary.

9. Film variables: musical background. Results on the use of musical backgrounds in instructional films are very incomplete. However, it should be reported that tests of two different films with "matched music" and "no music" versions have shown no favorable and significant differences for the film versions with musical backgrounds. The network of problems in this area has been examined and can now be stated appropriately for experimentation.

B. Film Utilization Procedures

1. A basic consideration of the Film Research Program has been that of learning whether or not films may be used as a relatively exclusive means of instruction. This is a matter of great importance to the Military services since in time of emergency there is frequently a shortage of well-trained instructors and lack of training equipment. Originally it was planned to investigate this problem by means of specially produced sound films made according to principles derived from the results of other research projects. Limitations imposed by expense and time led to the decision to use a large group of existing films on general science subjects, with an appropriate population, to test the hypothesis that instruction exclusively by means of films is possible. The

trends of results confirm this hypothesis. Furthermore, it is believed that if an integrated series of films were designed according to presently known principles and produced for teaching specific subject matter to audiences or classes of known characteristics, the series could do a highly effective instructional job in a shorter than average period of time. This could be achieved without the presence of well-trained instructors and without having actual equipment present in classrooms.

2. Distributed vs. massed presentation of films. Another reference point of the Film Research Program relates to "speeded-up" or rapid mass-instruction during training emergencies. In this connection consideration has been given to the problem of distributed versus massed instruction by means of films. Based on experimental results, the trend of thought is that films and film programs can be about three or four times as long as the average length of existing Navy training films (about 17 minutes) without losing any instructional effectiveness. Therefore, in rapid mass training programs it seems highly probable that training film sessions can be increased, if necessary, to at least one hour in length.

3. Introductions and summaries. A third consideration has been to learn what elements of the current practices of introducing and summarizing films by instructors can be built into the films themselves. It has been found that film introductions and summaries may vary in their effects from a point of interfering with the instructional effects of the main body of the film to a point of making a significant contribution to achieving the instructional objectives. The general belief is that properly planned and produced introductions and summaries in films may make it unnecessary for instructors to give verbal introductions and summaries which are related to the defined instructional objectives of the films.

4. Thoughts on learner participation. Theoretically it seems possible to increase the degree to which films effectively instruct audiences by having learners participate in the film program by answering questions or following certain actions during the film showing. Evidence thus far does not indicate that "audience participation" as generally conceived is an entirely adequate answer to this problem. Neither having the members of classes answer questions which were presented in films, nor by having them listen to and read repetitive statements of items to be learned produced significant differences in learning scores. Furthermore, having trainees actually tie knots while a knot-tying task was being demonstrated on the screen failed to increase the learning of this perceptual-motor skill.

In the light of these negative findings the problem of participation has been more clearly defined. The requirement of having those who are learning from films participate, copy (imitate), or practice the responses to be learned, must be produced in such a way as to make possible actual and effective participation. For example, in learning the knot-tying task attention is divided between watching the screen and actually tying the knots. Thus it would seem that the speed of development or rate of presentation of the films must be slowed down for complex knots, or other tasks, so that all members of the audience may actually tie the knots without becoming frustrated, inhibited and confused. Frustrated attempts to participate in a film-demonstrated task may actually retard (inhibit) learning. The present trend of thought still includes the hypothesis that practicing a response facilitates learning, but it is required to know specifically what the best conditions are for practice, what acts need to be practiced (both overtly and symbolically), and what degree of practice is required for maximum learning effectiveness. Furthermore, it is believed that procedures used to secure participation must not interfere with the organization of the material to be learned, nor distract from the essential facts to be learned, nor create adverse sets or attitudes on the parts of trainees.

5. Repetitive showings. Facts are accumulating which point to the conclusion that repetitive showings of most training films will enhance the amount of learning. For most films now in use, two or three showings in all probability would be justified in terms of optimal learning gains. Typically, existing training films have a rapid rate of development; they are packed with material either in the pictures, commentary, or in both these streams of communicative events. Repeated showings make it possible for learners to grasp more of the content. Nevertheless, there seems to be a widespread reluctance on the part of both instructors and trainees to presenting or viewing a training film more than once. In view of this and other expedient factors, consideration should be given to the possibility of printing or splicing together two or more "prints" of some films and distributing them for use so mounted on a single reel in order to encourage the optimal number of showings.

6. Study guides and other auxiliary aids to film learning. Evidence is accumulating which shows that printed study guides or other methods of enabling learners to review and study the materials presented by films, at times other than while the films are being shown, increase learning. There is the conviction that study guides should be used extensively and that new methods for aiding students to study films should be developed. Plans have been made for the testing of several newly devised procedures.

7. Requirements for maintaining full effectiveness at each stage of film communication. Finally, relative to trends of thought on film utilization, there is a growing conviction that each link in the long chain of communication must be strong, beginning with the statement of instructional objectives, on through every link of production and utilization, up to the final point of impact of the instructional film on the learner or trainee. Even the most nearly perfect film may have its instructional efficacy reduced by the weak links of faulty projection, sub-standard acoustics, poor screens, inadequately controlled lighting, lack of ventilation, and poor seating arrangements, etc. The conviction is that for most effective learning, films must be used under near optimum conditions.

III. TRENDS IN RESEARCH TECHNIQUES

A. Research Tools and Improved Tests

Analytical, objective and systematic research on sound motion pictures requires newer and more effective research "tools" than have been available. Means must be found for increasing the accuracy and objectivity of the judgments made on instructional films by expert observers or learners, if effective research is to be done. The demands usually made on such observers should be brought within their capacities for reacting and making evaluations as the film is being shown. Since panels of trained observers and highly skilled experts for studying and evaluating films can not be dispensed with easily, or at any early date, one possibility is to provide such groups with instruments or tools which will increase the accuracy, reliability and validity of their observations. More important, new and improved procedures are needed for testing and measuring the effects of film presentations on the behavior of individuals in audiences. For example, most measures of the effects of films are based on pencil-paper tests given to trainees or students following film showings. Theoretically parts of a film that induce learning may be eclipsed by other parts of the same program. In addition, the dependence on the use of verbal tests alone may fail to yield full measures of all the learning which has occurred. There is needed a reliable means of recording concurrently and continuously behavior changes as they result during showings of films.

In order to improve the possibilities of both the scope and quality of film research, two integrated electrical systems have been designed and constructed: The Classroom Communicator and the Film Analyzer. These systems will increase the possibilities of recording and measuring a wide range of effects produced by instructional or informative films on individuals in audiences.

Other contributions have been made to research methods and procedures. Most tests are samples of the resulting learning and not measures of the complete learning. In some research it has been found desirable to measure exhaustively the learning resulting from films. Hence, the development of the method of questioning to exhaustion of all possible concepts contained in films has been worked out and is a contribution to the solution of this problem. Similarly, it is desirable to know the particular sources within a film from which learning results. Accordingly, methods of test construction are being developed for correlating items of tests or performances with particular segments of the film, be they pictorial or sound, sections of the film associated with music or color, or cross sections of all streams of communicative events in the sound motion picture. These procedures are being developed for constructing film profiles which will show the effectiveness of various sections of a film.

B. Requirements for Experimental Designs

Much has been learned or further confirmed about the requirements for experimental designs for research on instructional sound motion pictures. Among the most important of these requirements are the following: (a) Experimental versions with controlled variables must be produced especially for research purposes. Rarely are existing films found suitable for investigating basic problems of film production or use. (b) Adequate test populations, both in terms of numbers and personal characteristics, must be used. (c) Care should be taken to ensure that tests are not only reliable, but also valid. Valid tests usually involve getting indices or full measures of those actual changes in behavior of the subjects which are induced by known variables in the film. It is not enough to have subjects say, for example, that they know how to assemble a breech block, tie knots, or identify objects by form and color; rather, for valid tests, performance demonstrations of the new learnings are required. The same considerations apply to measuring attitude and opinion changes. Furthermore, the test performances should be made under approximately realistic conditions.

C. Problem of Generalization of Results and Conclusions

A final consideration relative to film research methods is that of increased caution about generalizing results from one task or film to other tasks or films, or from one population to other populations. For example, findings which result from film experiments on non-precision measuring instruments may or may not apply without checks and adaptations to a film on precision measuring instruments. For purposes of learning about principles of film production and utilization the number of films or experimental versions of films used in an experiment is as important as the number of individuals included in the test populations.

D. Definition of Research Problems

During the beginning stages of the Instructional Film Program, it was found to be very difficult to state research problems precisely and in such a manner as to permit of an effective research approach. Confusions which characterized previous research in this field, as well as the lack of a rigorous, traditional pattern of research, contributed to these difficulties. Several ways of defining problems have since proven to be effective: (a) Problems can be defined in terms of sound film characteristics. An example would be to determine the relative effective learning from films in black-and-white versus the same subjects in color. (b) Problems may be defined in terms of film variables tested either singly or in controlled patterns (experimental versions). For example, slow development, phase relations of commentary to picture, 0° versus 180° camera angle, and content or "idea" density are film variables which can be controlled and dealt with experimentally. (c) Hypotheses may be formulated on the basis of known learning or instructional principles and tested out in the sound film medium. Examples of these kinds of hypotheses are the following: In order to learn, subjects must be given opportunities to practice that which is being learned; or, learning to a desired level requires a given and definable number of repetitions; or, learning will be effective in relation to the degree to which the attention of subjects is secured and held for the duration of the film. All three of these methods of formulating problems for research have been used in setting up the experimental projects of the Instructional Film Research Program.

It would seem that existing systems of learning theory, plus possible extensions of these systems by formulation of new and additional principles, constitute the best framework within which research problems may be defined and experimentally investigated. The main body of this report which has been prepared by Drs. Smith and Van Ormer documents this proposition.

SUMMARY REPORT ON PROJECT NO. 5

A CLASSIFICATION IN TERMS OF LEARNING THEORIES OF SOME AREAS FOR RESEARCH ON INSTRUCTIONAL FILMS

by

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INTRODUCTION

In the early planning and development stages of the Instructional Film Research Program, it was realized that a systematic approach to the field of research problems relating to instructional sound motion pictures was a necessity. The need for a classification of the various specific research problems which came to the foreground in staff conferences was also seen. Accordingly a conceptual framework was evolved which would serve to indicate areas in which research on instructional sound motion pictures might be profitably conducted.

The primary purpose of the present report is to provide an outline of this frame of reference. The framework has proved to be a useful working guide for the Instructional Film Research Program. Perhaps it may be of assistance to other research workers, not only in the field of instructional films but also in the closely related fields of "mass instruction": radio and television.

Following the appendix to this report there is a sheet which may be opened out and kept in view while reading the remainder of this report. This sheet contains a summary of "A Classification of Some Areas for Research on Instructional Films." It may help the reader's orientation if he keeps this sheet before him while reading the necessarily more detailed content of the report.

This report is immediately followed by an appendix which contains a summary of the experimental projects of the Instructional Film Research Program in their relation to the above mentioned classification of areas for research on instructional films.

This classification has five major sections: (I) the area of psychological learning principles and their relationship to learning from films, (II) the area of instructional film characteristics and their influence on learning, (III) the area of the development of equipment and procedures for testing instructional films, (IV) the area of research on methods of utilizing films in instruction, and (V) the area of reviews of pertinent literature and theoretical systems. Each of these major areas will be considered in a separate section of the report which follows.

I. THE AREA OF PSYCHOLOGICAL LEARNING PRINCIPLES AND THEIR RELATIONSHIP TO LEARNING FROM FILMS

This section contains a statement of principles and hypotheses of effective learning. Each of these principles delineates a sub-area of research inasmuch as each might be applied (and certainly some, with more or less systematic intent, have been applied) to instructional films.

This section of the report is based on reviews, digests, analyses of experimental reports from various areas of learning, including learning from films. There is no assurance, however, that principles of effective learning as currently formulated and derived in non-film situations can be directly carried over and applied to instruction by films; in fact it is almost certain that this cannot be done universally. Nor, for that matter, can a learning principle revealed in the use of a certain film be transferred, without verification, to other films or classes of films.

The following list of principles is viewed therefore as a systematically arranged body of general psychological learning principles which should be subjected to experimental testing in the film medium.

A number of the problems relating to instructional films, which were proposed for research under the Instructional Film Research Program, seemed to be closely related to one or more of these principles, and where possible the experimental design was modified in order to include investigation of them. Other projects were concerned from the outset with determining the effectiveness of certain of these principles in the motion picture medium. The extent of these investigations is shown in the appendix to this report.

The statement of learning principles now follows in outline:

A. MOTIVATION AND INCENTIVES

The learner must feel an urge (desire, drive, need, set, tension) to learn certain things if there is to be much learning (any complex learning). Within certain limits the more intense the motivation the greater will be the learning. Several sub-principles fall under this major precept:

1. EFFECTIVENESS OF GOALS. The goals to be achieved in the learning will serve to strengthen motivation to the extent that they are:

    a. Clear to the learner. E.g., learning is favored by an initial definite statement of the overall goal and by specific statements of the goals of each learning period - what the learner is expected to learn.

b. Accepted by the learner as desirable to achieve.

c. Attainable. With reasonable effort most learners should be able to achieve the goal established. In attaining an ultimate goal it may be desirable to set successive sub-goals.

2. KNOWLEDGE OF PROGRESS. When the learner is informed of his progress from time to time, motivation is usually sustained and strengthened.

3. PRAISE AND REPROOF. Praise for correct answers, or good performance, is frequently more motivating than reproof for a poor performance. Wise use of praise or reproof takes into account the makeup of the individual learner, his reaction under similar previous conditions, and the lasting influence of the praise or reproof on his learning attitude.

4. SUGGESTION. Positive suggestion, namely that mastery is possible or probable, aids motivation, whereas negative suggestion hampers motivation.

5. REALISM AND PRACTICABILITY. Motivation is favored when the material is presented in a realistic way, and in such a manner as to make clear the practicability of the material and the way in which it is actually used in practice.

6. ANTICIPATION OF EARLY USE. Motivation is strengthened when the learner is led to anticipate a use for the material in the near future.

7. EXAMINATION SET. Knowledge that there will be an examination on the material presented to be learned generally strengthens motivation.

8. CHALLENGE. An instructional presentation will motivate learners if it involves a challenge, and if in closing it stresses a challenge rather than a note of finality.

B. SELF ACTIVITY

The individual learns only by his own activity (mental and/or physical). What he learns are the responses (mental and/or physical) he makes and organizes. Within certain limits, the more active the mental or physical learning behavior, the greater will be the learning.

1. MENTAL PRACTICE OF A PROCESS. Learning a skill from a demonstration (as in a film) is enhanced when the learner himself (possibly during pauses in the demonstration and with direction for such mental practice):

a. Verbalizes the task: Formulates or restates verbal descriptions for the task.

b. Visualizes the task: Mentally pictures the performance.

c. Imagines the feel of the task: Imagines the feeling of going through the motions of the task.

2. RAISING AND ANSWERING QUESTIONS IN PRESENTATION. Mental participation is enhanced if questions addressed to the group as a whole are interspersed with intervals of straight information:

a. When questions are presented and the learner is required to answer.

b. When questions are presented, even though there is no expectation of the group's being able to answer them (question followed by slight pause and then answer given, e.g. "What happens when.........?)

3. LEARNER PROTAGONIST. Vicarious participation of the learner through use of a learner protagonist in the learning situation, may aid learning.

C. SEEING AND ORGANIZING RELATIONSHIPS

The learner ordinarily has some tendency to see and organize patterns or relationships in the material or activities which he is learning. But this tendency cannot be trusted to form the desired relationship unaided. This organizing process must be directed and facilitated for effective learning.

1. MEANINGFULNESS. The more meaningful the material to the learner, the more readily it is organized and learned.

a. Meaningfulness generally is enhanced by:

(1) Use of simple words familiar to the learner, and explanation of all unfamiliar and technical terms when necessarily used.

(2) Relation of new material to the learner's past experience by illustrations and analogies.

(3) A preliminary overview of the whole pattern of the material or process to be learned (i.e. an introduction).

(4) Having equipment or processes shown to the learner in the same relative position which these would have when viewed by him in actual practice or use.

(5) Adequate emphasis on essential details or features.

(6) Explanation of reasons why things should be done, if not too detailed.

(7) In some cases, explanation of how mechanism works. However, there is a danger of too extensive explanation early in learning.

(8) Reviews or summaries after logical units of material during each period of presentation, and at end of presentation.

b. Meaningfulness in the case of concepts is enhanced by:

(1) Varied experiences: presentation of varied, specific, realistic situations in which concept is illustrated and named.

(2) Simplified symbols: in certain cases of learning complex materials, representing these materials by simplified symbols.

(3) Personalization: representation of concepts by human or cartoon characters.

(4) Contrasts and similarities: clearly indicating differences and likenesses among concepts.

2. PATTERNING. Organization and learning are facilitated when the material is grouped into patterns in presentation, such as:

a. Functional patterns (as three interfunctioning parts of a gun).

b. Spatial patterns (as grouping of instruments on a panel).

c. Temporal patterns (rhythm in complex movements, as crew loading a gun).

d. Logical patterns (as precautions in ammunition room to avoid sparks, logically related because of common hazard).

3. IDENTIFIABILITY. Responses to a situation are easier to learn as the situation is more easily identifiable, or distinguishable from others (as necessary in assembly of four similar parts of a gun trigger mechanism).

D. THE PRINCIPLE OF EFFECT (reinforcement of responses)

In much learning a selective process occurs in which the individual tends to acquire and repeat those actions which have one or more of the following: (a) led to success in that situation, (b) tended to satisfy the motivating conditions, and (c) been perceived as means to desired ends.

Unsuccessful or annoying responses tend to be avoided and to shift the learner's activity to other actions (which may lead to success).

1. CHECKING OR OK BY THE LEARNER. For the fullest operation of this principle, it is desirable that there be a checking or "OK" of the successes in the mind of the learner (the "confirming reaction").

2. DEMONSTRATION OF WRONG METHOD. Once the right method is at least partially established, a vivid demonstration of the wrong method reinforces the right method provided the consequences of the wrong method are stressed.

E. PRACTICE AND/OR REPEATED PRESENTATION

Mere practice or repeated presentation of material has very little, if any, strengthening effect upon learning. Repetition apparently merely affords the opportunity for strengthening or weakening factors to affect the learning.

1. EXERCISE UNDER FAVORABLE CONDITIONS. Other things being equal, the progress of learning will depend upon the frequency of repetition under favorable conditions (motivation, effect, meaningfulness, etc.).

2. OVERLEARNING. Retention is favored if, in the initial learning, the material is practiced or repeated in presentation beyond the point of its being barely learned. However, repetition, or continuation of practice or presentation beyond the point where fatigue or boredom seriously occurs may have a negative effect upon the learning. Varied repetition (variation of non-essential details) tends to offset fatigue and boredom.

3. REALISTIC PRACTICE. It is usually advisable to practice an activity, as nearly as feasible, in the way in which it will be used or needed in the future.

4. PART-WHOLE PRACTICE. The relative effectiveness of a whole-part-whole learning sequence in practicing, versus learning the parts and then combining them, depends upon the degree of integration, difficulty, and length of material, and upon the ability of the learner.

(E.g., if a task is too difficult, or too long, to be learned efficiently as a unit, it may be desirable to break it into meaningful units, still stressing relationships to the whole).

5. SPACED PRACTICE. Under many conditions learning is favored when practice periods are spaced over intervals of time rather than massed together.

6. MINIMUM DELAY OF PRACTICE. The sooner the practice follows the instruction, the greater the benefit to learning. Immediate imitation of movements while viewing them may be desirable, provided that such activity does not distract from the observation of the movements being demonstrated.

7. REVIEWS. In general, well motivated reviews of material or processes are beneficial to learning.

F. GENERALIZATION, APPLICATION, OR TRANSFER

1. GENERALIZATION SET. The tendency or ability of the learner to generalize what is learned, in applying it to new problems, is aided by a set or attitude toward generalization which is induced as part of the instructional presentation.

2. RECOGNIZED SIMILARITY. Generalization from the material learned to application of that learning is facilitated by recognized similarity of material learned to the actual task performances. Instruction should point out, and foster recognition of, such similarities.

G. CHARACTERISTICS OF THE LEARNER

A person's ability to learn is affected by his:

1. General mental ability (intelligence).
2. Educational level.
3. Previous knowledge or skill possessed in relation to specific material to be learned.
4. Special aptitudes, e.g. mechanical, spatial, verbal, perceptual speed, kinesthetic sensitivity (muscle sense).
5. Facility for learning through the eye or the ear.
6. Attitudes and interests.
7. Past experience with various teaching techniques such as lectures, films, etc.

II. THE AREA OF FILM CHARACTERISTICS AND THEIR EFFECTS ON LEARNING

Films have certain attributes not readily related to one or two learning principles, but instead related to a considerable number of them. The effects of some of these film variables on learning from instructional films are perhaps best investigated by means of hypotheses relating to the film characteristics themselves. The purpose of such investigations would be to determine the relative effectiveness of these film variables under various conditions of learning. Representative film characteristics which lend themselves to evaluation are:

A. COLOR: in portraying natural characteristics, stressing certain parts or features, enhancing esthetic appeal, etc.

B. MUSIC

C. EMPHASIZERS TO DIRECT ATTENTION: novelty, size, contrast, isolation, rhythm, rhyme, etc.

D. VOICE CHARACTERISTICS

E. MULTIPLE SENSORY PRESENTATION: i.e., presenting material through both picture and sound track.

F. ESTHETIC TONE OR ARTISTIC QUALITIES

G. EMOTIONAL TONE

H. DRAMATIC VS. FACTUAL PRESENTATION

I. HUMOR

J. PERSONALIZED COMMENTATOR: well-known person, commentator off-stage, commentator shown in picture, lip-synchronous dialogue.

K. UNITS CLEARLY MARKED OFF: with use of pauses, fade-outs, titles, statements by commentator, etc.

L. PACING AND RATE OF DEVELOPMENT

M. VERBALIZATION CHARACTERISTICS: relative amount and kind of verbal commentary, level of difficulty, personal reference, use of nomenclature, etc.

N. TIME RELATIONS OF SOUND TRACK AND PICTURE

O. FACT FREQUENCY AND FILM LENGTH

P. ANIMATION: e.g. use of animation sequences to achieve simplification, or to show things which cannot be actually photographed.

Q. MODIFIED MOTION: slow motion, speeded-up motion.

R. CAMERA VIEWPOINT AND PERSPECTIVE: 0° vs. 180°; use of wide angle, long focus lenses for special perspective effects.

III. THE AREA OF DEVELOPMENT OF NEW EQUIPMENT AND PROCEDURES FOR TESTING INSTRUCTIONAL FILMS

To facilitate research, new equipment for classroom testing of films and for recording audience reactions to films must be developed. The efficient utilization of the new equipment will require the development of new standard procedures. This is a third major area for research.

IV. THE AREA OF RESEARCH ON METHODS OF UTILIZING FILMS IN INSTRUCTION

Typical problems in this area might be:

1. Can films be used as an exclusive means of instruction?
2. Are study guides a useful aid to learning from instructional films?
3. Is learning increased by supplementing sound motion pictures with related film strips?
4. Should a number of films be shown in a single training session, or should the films be spread over several days?
5. How many times should a film be shown for optimum effect on learning?
6. Does the insertion of questions or reinforcing statements in films result in more complete learning?
7. What is the value of note-taking during film showings?

Research in this area also includes investigation of a number of technical considerations as for example:

1. Quality of picture projection and sound reproduction necessary for effective instruction by films.
2. Effect of viewing conditions on learning from instructional films; e.g., ventilation, seating arrangements, screen-viewing angle and distance, screen brightness, degree of room-darkening, contrast between screen and surroundings, and room-acoustics.
3. Rear projection, under daylight conditions.

Some of the problems in this area have already been subjected to an appreciable amount of research; others are being currently investigated by the Instructional Film Research Program.

V. THE AREA OF REVIEWS OF PERTINENT LITERATURE AND THEORETICAL SYSTEMS

The successful prosecution of any research program depends upon a thorough knowledge of what has been done, and what is being currently studied in the field of the research. This is a final and most fundamental area for investigation.

APPENDIX

A SUMMARY OF THE EXPERIMENTAL PROJECTS OF THE INSTRUCTIONAL FILM RESEARCH PROGRAM IN RELATION TO THE FOREGOING CLASSIFICATION OF AREAS FOR RESEARCH

This section presents a summary, in the form of headings, of the areas for research outlined in the body of this report, with brief descriptions of the individual research projects of the Instructional Film Research Program entered in the appropriate sections. The aims are (a) to provide an overall view of the pattern into which the research projects fall, (b) to give brief descriptions of the essential nature of the projects, and (c) to indicate the results thus far obtained.

The only headings given are those to which research projects relate. On the other hand projects which have bearing on a number of problems, are referred to under several headings. The number and letter system used to designate headings in this appendix is the same as that used in the body of the report. The total organization of the classification of Areas for Research may be readily followed by folding out the summary sheet at the end of the report.

Note: When the term "significant" is used in relation to differences between groups or methods, it indicates that these differences are very unlikely to have occurred by chance.

EXPERIMENTAL PROJECTS IN THEIR RELATION TO THE CLASSIFICATION OF AREAS FOR RESEARCH ON INSTRUCTIONAL FILMS

I. THE AREA OF PSYCHOLOGICAL LEARNING PRINCIPLES AND THEIR RELATIONSHIP TO LEARNING FROM FILMS

A. MOTIVATION AND INCENTIVES

5. REALISM AND PRACTICABILITY.

a. LEARNER REPRESENTATION. Project No. 14. "Effects of Learner Representation in Instructional Films."

Various film versions instructing in the tying of a group of three knots were produced and used for the instruction of naval trainees. The variations among the films were in characteristics believed to be related to realism, namely:

Camera Angle: The films showed knots being tied, either from the position directly in front of, and facing, the demonstrator tying the knot (180 degree angle); or from the position of the demonstrator himself (0 degree angle).

Motion: Some of the films showed the normal, total action of tying the knot; others showed only progressive stages or steps in the knot tying, without showing the intervening action.

Hands: One of the "progressive-steps" films mentioned above was produced to include the hands of the person tying the knots. Another version, by stop motion photography, showed only the knots in various stages without the hands of the demonstrator.

Participation: This variable was investigated by means of variations of procedure in use of the films. In certain showings, the learners were given lines and required to tie the knots simultaneously with their presentation in the film; in most showings the learners viewed the film without such participation. In all cases learning was measured by the percentage of men able to tie the knots immediately following the film showing.

(1) Motion. Project No. 14. "Effects of Learner Representation in Instructional Films." (See above.) In respect to motion the results are inconclusive; pictures with motion were significantly superior for the most and least difficult knots, but this did not hold for the other knot.

(2) Hands Present Versus Hands Absent. Project No. 14. "Effects of Learner Representation in Instructional Films." (See above.) The successive stage or static versions of the knot tying films showed the line either by itself or being held by hands. It might be plausibly contended that the latter is more realistic. No significant differences in effectiveness were found between the two forms of presentation, and one of the slight obtained differences favored the "Hands Absent" version.

(3) Camera Angle. Project No. 14. "Effects of Learner Representation in Instructional Films." (See p. 30)

(4) Participation. Project No. 14. "Effects of Learner Representation in Instructional Films." (See above.)

b. THREE-DIMENSIONAL PRESENTATION. Project No. 20. "Effectiveness of Three-Dimensional Instructional Sound Motion Pictures for Perceptual-Motor Learning."

Three-dimensional films teaching assembly of the 40 mm anti-aircraft gun breech block, and knot tying, have been produced, and will be used experimentally in the instruction of naval trainees. To a large extent the general procedure, aside from the experimental variables, will be similar to those of Projects 10 and 14. Learners will be tested by actual performance immediately following the film showings in order to obtain measurements of learning.

Learning with the three-dimensional films will be compared with learning from otherwise identical two-dimensional films. Another presentation variable will be showings in which the learners wear Polaroid spectacles but actually view two-dimensional films.

c. AUTHENTIC SOUND. Project No. 35. "The Effects of Authentic Sounds in Instructional Films."

Three versions of an instructional film on The Typing Stroke are being produced, with variations in sound. The sound track of one version includes the sound of the actual typing stroke; another includes simulated sound of the stroke; a third version has no sound except commentary. Groups will be instructed by the films and tested for learning with a performance typewriting test.

B. SELF ACTIVITY

2. RAISING AND ANSWERING QUESTIONS IN PRESENTATION.

Project No. 13. "The Effects of Inserted Questions and Statements on Film Learning."

Two existing films, one on general information (Snakes), and one on technical information (Care and Use of Hand Tools--Wrenches), were altered to include multiple choice questions at intervals. The questions appeared visually and also in the sound track. Following each question is a time interval sufficient to permit the viewers to answer the question, and the correct answer is then given in the film.

A similar alteration was made in the same films with the insertion of statements in place of the questions, covering the same items of information. The films were used to instruct 10th grade school pupils. Those taught by the question versions responded by marking answer sheets before the correct answers were given in the films; they then checked their answers with those given in the films. Learning was measured by information tests given immediately following the film showings, and again after an interval of four weeks. There was thus provided a means of comparing the effectiveness in film learning of statements versus questions responded to and checked, the latter providing active audience participation and also an opportunity for the learner to confirm his right responses.

Two frequency levels of questions and statements were included in separate films, giving "Persistent Questions," "Persistent Statements," "Medium Questions," and "Medium Statements" versions. As controls, the original versions of the films were shown once to certain groups, and twice to other groups (to compensate for the increased length of the altered films).

More learning resulted from the films in which material was emphasized by questions or statements, although the differences were small. The favorable difference in learning afforded by the various "Question" and "Statement" versions over the original films shown once, was never greater than an average of 6.1 items (out of a total of 70 items in the test). The difference favoring the "Question" and "Statement" versions over the original film shown twice was never greater than an average of 3.5 items for any of the groups. In the comparison of the relative effectiveness of "Questions" versus "Statements" inconsistent differences were found.

The increase in learning applied to those items upon which the questions or statements had direct bearing rather than to other information in the films.

3. LEARNER PROTAGONIST.

Project No. 33. "Employment of Sound Films for Restructuring Attitudes." (See p. 37)

Project No. 14. "Effects of Learner Representation in Instructional Films." (See p. 27)

C. SEEING AND ORGANIZING RELATIONSHIPS

1. MEANINGFULNESS.

a. MEANINGFULNESS (GENERALLY).

(3) Preliminary overview -- introduction.

Project No. 17. "Contributions of Varied Film Introductions and Summaries."

Three extant films on mammals, geography and sulphur, with typical film introductory sequences, were altered to produce two versions of each film, one retaining the introduction, and another with the introduction removed. These films were shown to various groups of 9th grade pupils, and comparisons were made between learning from the "Introduction" and "No-Introduction" versions. Learning was measured by tests on the film content, exclusive of material covered only in the introductions, following the film showing. A control group which saw no film was also tested.

The results on the effectiveness of the film introduction in learning are inconclusive. For two of the films, more learning resulted with the "Introduction" versions, and for one of these films the difference was significant. However, the "No-Introduction" version was more effective for the other film. Both film groups tested significantly higher than the control group on the learning test.

(4) Having equipment or processes viewed from the same relative position as in use.

Project No. 14. "Effects of Learner Representation in Instructional Films." (See p.26)

Large and consistent differences in ability to tie all the knots were found, favoring the learners taught by the film taken at 0 degrees (so-called subjective camera position), as opposed to those who were instructed by the film taken at the 180 degree position (directly facing the demonstrator in the film).

(5) Adequate emphasis on details.

Project No. 12. "Relationship of Length, Fact Frequency, and Difficulty, to Effectiveness of Instructional Motion Pictures." (See p. 44)

The difference between the "long-short" and "light-heavy" versions of the experimental films involved a variation in emphasis on details. Since the learners are being tested on both details and total film content, an analysis of the effect on learning of emphasis on details will be possible.

Project No. 10. "Effects on Training of Experimental Film Variables, Study I: Verbalization, Rate of Development, Nomenclature, Errors, "How-It-Works," Repetition." (See p. 31)

Slow speed of development, which involved emphasis on details was found to be superior to more rapid development. Demonstration of wrong procedures to be avoided, after right procedures had been shown, was also found to be effective.

Project No. 19. "Commentary Variations: Phase Relations, Level of Verbalization, and Learner-Reference in Instructional Films on Perceptual Motor-Tasks." (See p. 42)

Medium level of verbalization, which might be considered as adequate emphasis on essential details in this situation, was found to be the most effective level of verbalization. Apparently, the "pointer" effect of a commentary which "leads" the picture may be effective in teaching relatively complex tasks requiring verbal directions.

(7) How the mechanism works.

Project No. 10. "Effects on Training of Experimental Film Variables, Study I: Verbalization, Rate of Development, Nomenclature, Errors, "How-It-Works", Repetition.

Seventeen different versions of a film teaching the assembly of the breech block were produced and used as the means of instruction for groups of naval trainees. Measurement of learning was in terms of time taken to assemble the breech block on the first trial immediately after the film instruction. The experimental variations, or characteristics, differing from film to film, were:

(a) How it works: sequence showing how the mechanism works in operation, and something of its relationship to the rest of the gun.

(b) Showing errors to be avoided: wrong as well as correct methods of assembly were shown.

(c) Repetition: 1, 2, 3, or 4, appearances of assembly sequences.

(d) Technical nomenclature: included and omitted.

(e) Rate of development: slow and fast.

(f) Level of verbalization: low, and high.

Variations among the films provided four comparisons of versions with and without the "How-It-Works" sequence. The results are inconsistent, with two comparisons favoring omission of "How-It-Works," and two favoring inclusion of this variable. The one difference which was large enough to be significant favored omission of this variable.

A possible interpretation of the results is that the particular "How-It-Works" sequence which was used added little, if anything, to a film already rather highly loaded with characteristics favorable to learning, but that it was something of a help to a film sparsely loaded with such characteristics. The "How-It-Works" sequence which was used seemed, by general impression, to be rather complex--perhaps too complex to provide orientation and general understanding of the relationships of the breech block to the gun as a whole. Consequently, Project 44 was undertaken to investigate more fully the effect, on learning, of showing "How-It-Works".

Project No. 44. "Effects on Training of Experimental Film-Variables, Study II: "How-It-Works," Verbalization, Participation, Succinct Treatment."

Further experimentation, which has involved the production of new films, is underway to clarify the possible contribution of the "How-It-Works" variable in learning. The general experimental procedure is the same as that of Project No. 10. Film versions have been produced and are being tested. In these versions a new, and ostensibly simpler, "How-It-Works" sequence is included, and the position of this sequence in respect to the other parts of the film is being varied.

(8) Reviews or summaries.

Project No. 17. "Contributions of Varied Film Introductions and Summaries to Learning from Instructional Films."

Three extant films on magnetism, geography, and living cells, with typical summary sequences at the end, were altered to produce two versions of each film, one with a summary, and one without a summary. These films were shown to various groups of 9th grade pupils and comparisons made between learning from the "Summary" and "No-Summary" versions. Learning was measured by tests on the film content, exclusive of material contained only in the summaries. A control group which saw no film was also tested.

In seven of nine comparisons between "Summary" and "No-Summary" groups, the differences in learning favored the "Summary" groups, and in two of the seven comparisons the differences were significant. Both film groups tested significantly higher than the control group on the learning test.

2. PATTERNING.

c. Temporal.

Project No. 19. "Commentary Variations: I. Phase Relations, Level of Verbalization, and Learner Reference in Instructional Films on Perceptual-Motor Tasks." (See p. 44)

d. Logical.

Project No. 10. "Effects on Training of Experimental Film Variables, Study I: Verbalization, Rate of Development, Nomenclature, Errors, "How-It-Works," Repetition." (See p. 32)

3. IDENTIFIABILITY.

a. Color. Project No. 6. "Relative Effectiveness of Color and Black-and-White in Instructional Films." (See p. 39)

b. Camera Angle. Project No. 14. "Effects of Learner Representation in Instructional Sound Films." (See p. 26)

c. Third Dimension. Project No. 20. "Effectiveness of Three-Dimensional Instructional Sound Motion Pictures for Perceptual-Motor Skills." (See p. 27)

D. THE PRINCIPLE OF EFFECT

1. CHECKING BY THE LEARNER.

Project No. 13. "The Effects of Inserted Questions and Statements on Film Learning." (See p. 28)

2. DEMONSTRATION OF WRONG METHOD.

Project No. 10. "Effects on Training of Experimental Film Variables, Study I: Verbalization, Rate of Development, Nomenclature, Errors, "How-It-Works," Repetition." (See p. 31).

In certain of the film versions, possible errors to be avoided, as well as correct methods in assembling the breech block were shown. Consequences of the errors were clearly shown by indicating the impossibility of successfully completing the assembly when they were committed.

Comparison of results from the four films containing the "Showing of Errors to be Avoided" sequence, with those from four films in which the "Errors" sequence was omitted, shows superiority in learning effect for the "Errors" sequence films in all four instances. In three of the four cases the differences are significant.

Project No. 29. "Relative Effectiveness on Learning of Showing Right or Right-Wrong Methods in Film Presentations of Conceptual Learning and Perceptual-Motor Tasks."

An experiment is being designed to investigate the relative effectiveness of presenting Right and Right-Wrong methods of performing a task. Operation of a motion picture projector is being considered as the perceptual-motor task to be learned; the conceptual learning task has not yet been selected. The relative positions of the Right and Right-Wrong sequences in the film will be an experimental variable; it is also intended to investigate the amount of generalization in learning from the two methods.

E. PRACTICE AND/OR REPEATED PRESENTATION

2. OVERLEARNING.

Project No. 10. "Effects on Training of Experimental Film Variables, Study I: Verbalization, Rate of Development, Nomenclature, Errors, "How-It-Works," Repetition." (See p. 31).

Most of the breech block films contained two assembly sequences. However, variations in repetition of assembly sequences provided the following three comparisons among the films in respect to this variable:

> Film L containing four assembly sequences showed significant superiority in learning effect over Film A with two assembly sequences.
>
> Film G with three assembly sequences has a slight, though insignificant, superiority over Film F with two assembly sequences.
>
> Film N with two assembly sequences was significantly superior to Film O with one assembly sequence.

The favorable effect of Repetition was consistent, and is believed to be one of the most effective variables revealed in this study.

Project No. 13. "The Effects of Inserted Questions and Statements on Film Learning." (See p. 28)

Films altered by the insertion of questions (which were answered and checked by the learners) and statements, were shown to be conducive to somewhat greater learning than single showings of the original, unaltered films. However, the simple and inexpensive procedure of showing the original, unaltered films twice gave results which were only slightly below the best results obtained with the various "Question" and "Statement" versions.

Project No. 24. "Effects of Repetitive Presentations on Rate and Amount of Learning."

Four films, one dealing with each of the subjects of chemistry, electrochemistry, colloids, and food and nutrition, are being used to instruct four equated groups of college students. Each film is being shown once, twice, three times, and four times, to different groups. The repetitive showings come in immediate succession.

All groups are pre-tested on the areas of information covered in the films. Learning tests are being administered on the day following the showing of the film. There will be possible for each film, a determination of its relative effectiveness in instruction when shown once, twice, three times and four times.

3. REALISTIC PRACTICE.

Project No. 14. "Effects of Learner Representation in Instructional Films." (See p. 26)

6. MINIMUM DELAY OF PRACTICE.

Project No. 14. "Effects of Learner Representation in Instructional Films." (See p. 26)

Learners provided with line, and required to attempt to tie the knots simultaneously with their being demonstrated in the film, did not perform better in the subsequent test of knot-tying ability than did those who merely viewed the film. It had been expected that such imitative activity would probably improve the learning.

As a matter of fact, only a few more knots were tied in the attempted simultaneous practice period than in the test period which followed. In other words, practice was not actually achieved to any real extent. A very tenable explanation is that the films were not primarily produced to serve as guides for immediate imitation on the part of the viewers, and their pacing is very likely too fast to allow time for all learners to tie the knots. To the extent that this is true the factor of "immediate imitation" was not put to a critical test in this study (this was not its primary purpose).

7. REVIEWS AND SUMMARIES.

Project No. 17. "Contributions of Varied Film Introductions and Summaries to Learning from Instructional Films." (See pps. 29 and 32).

G. CHARACTERISTICS OF THE LEARNER

1. GENERAL MENTAL ABILITY and

4. SPECIAL APTITUDES.

Project No. 21. "Characteristics of Subjects in Relation to Film Learning Gains."

Subjects in the commentary variation study on instruction in knot-tying by films (Project 19, see page 42) were tested on the Verbal Factor of the Thurstone Tests of Primary Mental Abilities. Subjects in the learner representation study on knot-tying (Project No. 14, see page 26) were tested on the Space Factor of the same test. Relationships among the Special Abilities test scores and learning success with the use of the various film versions are being investigated.

Learners in the study on instruction by films exclusively, films plus study guides, and instruction by customary methods (Project No. 15, see page 49) were given a test of intelligence which provides verbal and non-verbal sub-scores. Scores on these tested abilities are being related to learning induced by the various methods employed.

5. LEARNING THROUGH EYE OR EAR.

Project No. 32. "Relative Contributions to Learning of Video and Audio Elements in Films." (See p. 40)

Project No. 6. "Relative Effectiveness of Color and Black-and-White in Instructional Films." (See p.39)

6. ATTITUDES AND INTERESTS.

Project No. 25. "Investigation of the Effects of Prestige Factors on Learning from Sound Films."

A film with a social theme, involving two prestige variables, prestige of person and prestige of social role, is to be shown. Subject groups will be used in which variations in prestige attributed to the (known) main character, and to the role he plays, will be measured in advance of the film showing. Attitude toward the theme of the picture will also be measured before the film showing.

Following the film showing the groups will be tested for learning of the film content, and for attitude toward the theme of the film. Prestige of Person and of Role, as pre-measured, will be related to film learning and attitude change.

Project No. 33. "Employment of Sound Films for Restructuring Attitudes."

Four versions of a film now ready for production are to be used in a study of techniques possibly suitable for production of change in attitude with respect to the Negro. All versions are motion pictures made from artists' drawings depicting situations, with varied commentary. The basic version, containing a protagonist, is favorable to the Negro. Other versions vary as to: pro and con presentation, presence or absence of protagonist, and inclusion or omission of scientific factual material.

The versions will be shown to groups from three geographic areas in which considerable differences in attitude toward the Negro are found. Measurements of attitude will be made before and after the showing of the films.

A secondary phase of the study has to do with predicting the likelihood of attitude change. In addition to measuring the attitude toward the Negro, certain groups will be given a cluster of conservatism-liberalism attitude scales. The theory will be investigated that a close agreement in scores for an individual between the two types of attitude scales, indicates a high degree of integration of attitude, which is more likely to resist change.

7. PAST EXPERIENCE WITH FILMS, ETC.

Project No. 30. "Practice Effects in Film Learning."

At the completion of Project No. 15 (See p. 49) there were three populations of 9th grade students which had been subjected to varying amounts of film instruction in general science.

In an effort to determine what effects the previous instruction by a large number of films (49) might have upon subsequent learning from films, all three groups were later shown four films of general information (geography, natural history, etc.) and tested for learning of their content. Preliminary analysis of results indicates that, in subsequent film learning, the group which previously had been instructed by use of 49 films was considerably and probably significantly superior to the group which had previously been instructed by customary means without the use of films. The group which had been instructed with the 49 films plus study guides was in the intermediate position relative to the other two groups.

II. THE AREA OF FILM CHARACTERISTICS AND THEIR EFFECTS ON LEARNING

A. COLOR

Project No. 6. "Relative Effectiveness of Color and Black-and-White in Instructional Films."

Five instructional films were shown in black-and-white to some 9th and 10th grade pupils, and in color to others, in an attempt to determine the contribution of color in film learning. Conceivably color might contribute to the effectiveness of instructional films in three ways: (1) it may add to identification and understanding where color is an important natural characteristic of the subject matter; (2) it may be helpful in adding emphasis even when not natural to the subject matter; and (3) it may exert influence through aesthetic appeal. Following the film showings learning was measured with the use of tests containing classes of items intended to reveal the effectiveness of color in each of the three ways indicated above. Items were also classifiable according to whether they related to material presented visually, in the commentary, or both visually and aurally.

Preliminary analysis of results for two of the five films tends to indicate that there was little difference in effectiveness between Color and Black-and-White, even when the subject matter had color as an important natural characteristic. Further analysis is in progress.

B. MUSIC

Project No. 7. "Musical Backgrounds in Instructional Films."

As an approach to the problem of the value of musical backgrounds in instructional films for children, pupils in the 3rd, 4th and 5th grades of a public school system were shown one of two versions of the film "We Make a Fire." The children were randomly selected for placement in one of three groups:

Group 1.	Saw the Musical version of the film--musical background throughout.
Group 2.	Saw the Non-Musical version of the film--music only at the beginning and end.
Group 3.	Control group--saw no film.

All three groups were given tests covering the factual material included in the film, attitude toward fire, and liking for or interest in the film (last omitted for the control group). Groups 1 and 2 were tested immediately following the film showing, and also at an interval of five weeks. Treatment of the results is in progress to determine the relationships between the presence or absence of music and the three responses tested.

C. EMPHASIZERS TO DIRECT ATTENTION

Project No. 22. "Attention-Gaining Devices in Films." Five film versions on the subject of precision measuring instruments are in preparation, differing from each other in the use of attention-gaining devices or emphasizers. One film has a minimum of such devices and will serve as a control film. Attention-gaining devices have been built into the visual or sound tracks of the other four films to give the following versions:

Films containing relevant attention-gaining devices (devices related to the subject matter of the films):

Film 1: Devices in pictures only (e.g. stop-motion, ultra close-ups, arrows, spotlighting)

Film 2: Devices in sound track only (e.g. voice contrast, verbal direction, change of narrator, etc.)

Films containing irrelevant attention-gaining devices (devices not related to subject matter of film, but intended to attract attention to the screen):

Film 3: Devices in picture only (e.g. pictures of unusual objects, moving geometrical patterns, etc.)

Film 4: Devices in sound only (e.g. unusual noises, snatches of music, etc.)

Control Film:

Film 5: A basic instructional film with a minimum of attention-gaining devices.

The relative effects on learning of these various devices is to be investigated.

E. MULTIPLE SENSORY PRESENTATION

Project No. 32. "Relative Contributions to Learning of Video and Audio Elements in Films."

Various versions of two films on aerodynamics, one on theory and one on practice, will be used in instruction of groups of 10th, 11th, and 12th grade pupils. To some groups there will be a showing of the pictures without sound track, and to others the sound track will be played without pictures. Certain groups will see picture only for one film, and will hear sound track only for the other film. A control group will have no contact with either film, and one of the experimental groups will be exposed to picture and sound track for both films. All groups will be given a test of learning covering both films, which will yield sub-test scores for each film, and for items presented in picture, sound track, and both. This study is being duplicated in its essential details with use of a film on survival in the desert and with other groups.

H. DRAMATIC VS. FACTUAL

Project No. 28. "Comparison of Learning from 'Dramatic' and 'Factual' Films."

Scripts have been written for three instructional films to be produced on the subject of etiquette in an informal dinner situation. Three forms of presentation are involved:

(1) factual: straight information and commentary;

(2) dramatic-characters, with emphasis on one or two characters shown acting out the situation; and

(3) dramatic-story, in which characters are taken through a plot involving conflict and climax.

The groups instructed with the different versions will be tested and compared for learning.

L. PACING AND RATE OF DEVELOPMENT

Project No. 10. "Effects on Training of Experimental Film Variables, Study I: Verbalization, Rate of Development, Nomenclature, Errors, "How-It-Works," Repetition." (See p. 31).

Included among the breech block films were some which differed systematically in speed of development of the subject. Those with slow development contained more pictorial material, and somewhat more verbal description than did those with fast development. The major difference was in the amount of pictorial material. The films with fast development were about 39 percent of the length of those with slow development.

Two comparisons are possible between pairs of films differing in this respect. In both cases slow development was superior to fast development in teaching assembly of the breech block. The differences are considerable in both instances, and clearly established as significant in one of them.

M. VERBALIZATION CHARACTERISTICS

1. LEVEL OF VERBALIZATION (RELATIVE AMOUNT).

Project No. 19. "Commentary Variations: I. Phase Relations, Level of Verbalization, and Learner-Reference in Instructional Films on Perceptual-Motor Tasks."

Short versions of films, differing in commentary characteristics, and demonstrating the tying of three knots of varying difficulty, were shown to groups of naval trainees. The test of learning was in the actual tying of the knots immediately following the showing of the films.

The film version with "No Verbalization", that is, no words spoken, was the poorest version in terms of the percentage of men learning to tie the knots. "Low Level Verbalization" was more effective than "No Verbalization" for two of the knots. "High Verbalization" gave results quite similar to "Low Level Verbalization." The most effective version of all was "Medium Level Verbalization."

Project No. 10. "Effects on Training of Experimental Film Variables, Study I: Verbalization, Rate of Development, Nomenclature, Errors, "How-It-Works," Repetition." (See p. 31).

The breech block films included two pairs of films, the members of each pair being equal in length and picture content, but differing in the amount of verbalization or word density. The higher amounts of verbalization do not represent increases in the form of verbal "padding", but increases in the amount of information given verbally. Words in these films ranged between 73 and 147 per minute of film.

In both comparisons the "High Verbalization" versions were slightly superior to the "Low Verbalization" versions in effects on learning. However, the differences were so slight as to be insignificant.

Project No. 44. "Effects on Training of Experimental Film Variables, Study II: "How-It-Works," Verbalization, Participation, Succinct Treatment."

Further experimentation is under way in which "Medium Verbalization" versions are being investigated as well as "High" and "Low Verbalization" versions.

2. PERSONAL REFERENCE.

Project No. 19. "Commentary Variations: I. Phase Relations, Level of Verbalization, and Learner-Reference in Instructional Films on Perceptual-Motor Tasks." (See p. 42)

The versions of the knot tying film using the Imperative Mood ("Hold....") and the Second Person ("You hold..") in the commentary were the most effective versions. First Person ("I hold ...") was in the middle position in effectiveness, not differing significantly from the other versions. Third Person Passive ("It is held...") was clearly the least effective version, being significantly inferior to Imperative Mood and Second Person.

3. TECHNICAL NOMENCLATURE.

Project No. 10. "Effects on Training of Experimental Film Variables, Study I: Verbalization, Rate of Development, Nomenclature, Errors, "How-It-Works," Repetition." (See p. 31).

Although it was not a purpose of the breech block films to teach technical nomenclature. versions with and without nomenclature were included to investigate the possible effects of its use in the teaching of this assembly task.

Four comparisons involving this variable were made. In two comparisons, the versions with nomenclature were slightly but insignificantly superior to the versions without it. In the other two comparisons, the versions without nomenclature were moderately and significantly superior. The results are not conclusive but suggest that omission of nomenclature may be favorable to the learning of such an assembly task, when the learning of nomenclature is not an objective of the instruction.

N. TIME RELATIONS OF SOUND TRACK AND PICTURE

Project No. 19. "Commentary Variations: I. Phase Relations, Level of Verbalization, and Learner-Reference in Instructional Films on a Perceptual-Motor Task." (See p 42).

Phase Relationships. For all knots, film versions in which the verbal statements (directions or descriptions) began 2 seconds before the visual representations of the knot tying movements to which they pertained, were more effective in learning than were the versions in which the verbal statements began 3 seconds after beginning of the movements to which they pertained. The differences favoring the "Lead" over the "Lag" in commentary were slight, except in the case of the most difficult knot, where the difference was significant. Here sequence of movements was more complex and the commentary consequently included more verbal cues than were necessary for the simpler knots.

O. FACT FREQUENCY AND FILM LENGTH

Project No. 12. "Relationship of Length, Fact Frequency and Difficulty, to Effectiveness of Instructional Motion Pictures."

A number of versions of a film on The Weather have been constructed by selecting footage from existing films and producing new sound tracks. These four versions, which vary in length, and number of facts per minute, may be represented as below:

30 Minutes:	15 Minutes:
LONG HEAVY 224 facts	SHORT HEAVY 112 facts
LONG LIGHT 112 facts	SHORT LIGHT 56 facts

The experimental plan provides for instruction of various equated groups with the different versions, and subsequent testing of learning achievement; there are control groups which see no films. The test, to be used for all groups, is comprehensive enough to cover all the material in the various film versions. It will also be scored separately for the material treated in the various versions.

Experimental work has been completed for a population of 12th grade pupils, and is now under way with a population of Air Force trainees. Major comparisons will be between the absolute and relative amounts of learning for the various versions.

III. THE AREA OF DEVELOPMENT OF NEW RESEARCH EQUIPMENT AND PROCEDURES FOR TESTING INSTRUCTIONAL FILMS

A. DEVELOPMENT OF NEW EQUIPMENT

Project No. 2. "Film Analyzer Equipment"

A new device has been development and constructed which permits up to 40 film observers to record responses to a motion picture as it is being viewed. Ninety writing pens mark a band of recording paper which runs in synchronization with the film. Each response may be made in any one of five categories. The recording of responses may be quantified into discrete occurrences, e.g., number of times a technique is used; or time values, e.g., duration of titles or close-ups. Linear recordings may be translated into numerical results by the use of a photo-electric line scanner.

Project No. 34. "Experiments on Functional Characteristics of the Classroom Communicator."

Project No. 3. "Group Instruction and Test System (Classroom Communicator)."

Project No. 39. "Development of a Printing Device for the Classroom Communicator."

Development of the Classroom Communicator, now nearing completion, has been carried on under Projects 3, 34, and 39. Its basic purpose is to provide a means of improving instruction through better communication between instructor and learners. It is especially adaptable to the situation in which the instructional procedure is largely in the nature of film presentation. The primary emphasis has been upon the human engineering requirements of such a system in terms of highly desirable functional characteristics for the learning situation.

Basically the system compromises 40 response stations, one at the position of each learner, which accept multiple choice responses (up to five choices) made by the learners, and convey them to a receiving, summarizing, controlling, and recording unit at the instructor's desk. At any point in a film or oral presentation the instructor may ask a question and have the learners respond by selecting and pressing response keys. The response keys can then be locked. Automatically there is indicated at the instructor's station the individuals who answered correctly, and the percentage of the class answering correctly, as well as the individuals and percentage of the class making each wrong choice. The group may be divided into competing sections for which scores will be separately indicated. A flash sign can be used to inform the group of the correct answer. The response data are automatically recorded on paper. Another feature is that total test scores for each individual are available immediately at the conclusion of testing.

Among the advantages for the learning situation which are provided are: the instructor has a running check on the rate of learning and the effectiveness of the instruction in part or whole; the learner participates actively and has opportunity to check his responses, to confirm the correct ones, or to inform the instructor when material is not clear; and, both group and individual competitive spirit may be applied in learning.

A system coordinating the Classroom Communicator with the Film Analyzer has been developed thus providing both continuous and discrete variable recording. Such a device offers considerable possibilities in analysis of films by observers in pre-view film analysis, and in instructor training.

Project No. 23. "Physiological Indicators of Subjects' Involvements During Learning."

Working on the hypothesis that pulse-rate characteristics might be useful as an indication of involvement in an ideational stimulus situation, the development of apparatus suitable for trial use was undertaken. The apparatus includes a small "button microphone" which is strapped over the carpal aspect of the radial artery of the right arm, a frequency modulation oscillator, amplifier, and Esterline-Angus recorder. A group of nineteen subjects showed sufficiently different pulse-rate characteristics, when listening to "interesting" and "non-interesting" electrically recorded lectures, to indicate that such measurements hold reasonable promise for development as valid indications of audience involvement.

Project No. 40. "Development and Evaluation of a Flexible Device for Individual Film Study."

Functional requirements have been formulated, although construction has not yet started, on a sound motion picture viewer for individual study use in daylight conditions. Variable speed control would permit running of the film at the highest speed compatible with intelligibility to allow rapid scanning, and a special picture and word spotting device will facilitate the location of sections of the film for intensive study. Sound would come through ear phones. Such a device would seem to have utility in both individual study and film editing.

Project No. 41. "Development of a Flexible Multiple Channel Magnetic Film Recording and Reproducing System."

In connection with Project 42 (see p. 48), and partly to serve its purposes, there will be undertaken the development of a multiple channel magnetic recording and reproducing system. This will involve a method of recording several channels on the same magnetic film, and reproducing the sounds from the separate channels through independent and differently located sound units.

B. DEVELOPMENT OF NEW PROCEDURES

Project No. 27. "Development of Procedures for Constructing Temporal Profiles of Learning from Instructional Films."

Measurement of effectiveness of films in instruction is usually in terms of the learning resulting from the entire film, or from gross divisions of it. It is the task of this project to develop procedures for determining the effectiveness of the various parts or segments of the film. Development of a film profile is being undertaken, the horizontal axis of which is to be a time line in terms of the running film, in divisions of approximately five seconds. The vertical axis is to indicate the resulting amount of learning for each segment of the film, as determined by testing subsequent to instruction with the film. Preliminary results have been obtained for a high school population and are being analyzed.

Project No. 38. "Procedural Requirements for Audience-Controlled Film Flexibility for Rapid and Complete Learning at Multiple Levels."

Experimentation in learning will be conducted with a series of films of increasing difficulty on a given topic. For each film, commentaries of varying levels of difficulty will be produced; as, for example, an every-day language commentary, and an advanced technical commentary. The level of commentary used in the first showing of a film in a series will be determined by preliminary analysis of the audience prior to the showing. Levels of commentary difficulty in succeeding films will be set by response of the audience to the first showing, and so on for subsequent films.

Summary reviews to establish maximum learning will be conducted with shorter film showings of material from the content of the series. Progression in commentary from the original series to the last review will be in the direction of more technical terminology.

Project No. 26. "Development of Procedures for Pre-Release Testing of Instructional Films."

Attempts are being made to set up procedures for testing films both at the pre-production stage and before they are finally released. Pre-production procedures include use of film-slides or film-strips with recorded commentaries, story-board sketches, "script-in-hand" presentations, and "rough-cut" versions of films. Pre-release testing involves testing and evaluating the actual instructional performance of a film prior to its release. Both these procedures are based on psychological testing methods used on test populations whose characteristics are similar to those of the audience for which the film is intended.

Project No. 33. "Employment of Sound Films for Restructuring Attitudes."

Prior to production of finished experimental films (see p.37), pre-production models of the films were built with color slides and magnetically recorded commentary. These were shown to a sample population as a means of evaluating effectiveness of commentary, pictures, and other variables. Findings of this pre-production study indicate valuable revisions and economies that could be made in the final films.

Project No. 42. "Experimental Development of Equipment, and Evaluation of Monaural and Finaural Sound Integration with Pictorial Fields in Sound Films."

This study is intended to investigate the effect upon film learning of the use of binaural stimulation, that is, simultaneous sound track stimulation from at least two sound sources (speakers or ear phones) rather than from a single source. It is conceivable, for instance, that binaural stimulation with the use of sound sources on each side of the learner might give him an impression of being able to localize the sound more accurately in relation to the relevant picture content, or might serve to increase the impression of realism. Separate groups are to be shown the same films with monaural and binaural stimulation, and tested for learning achievement.

IV. THE AREA OF RESEARCH ON METHODS OF UTILIZING FILMS IN INSTRUCTION

A. FILMS COMPARED WITH OTHER MEANS OF INSTRUCTION

Project No. 15. "Relative Effectiveness of Instruction by: Films Exclusively, Films plus Study Guides, Standard Lecture Methods."

Each of three initially equated groups of ninth grade girls and boys were taught facts and principles in four areas of general science by one of three methods:

Films Only Group:	Instructed only by seeing a series of 49 existing general science sound films. Each film was shown twice and the experiment extended over a period of 3 months.
Film Plus Study Guides Group:	Instructed by use of above films shown twice supplemented by especially prepared study guides, which called for the answering of questions on the film material.
Control Group:	Instructed by usual teaching methods, without use of motion pictures.

No significant differences in learning resulted among the groups as measured by achievement tests. The differences were generally small, the greatest one being a superiority of 11% for the "Films Plus Study Guides" group over the Control Group in one of the four areas of study. The "Films Only" group was actually in last position by a small margin in three of the areas covered. It was in second position in the other area. A re-test of learning after a three-month interval gave substantially the same results. The outcome strongly suggests that subject matter of this nature can be practically taught as well by the use of films alone, as by use of the other teaching procedures, even though the films were not specifically produced to serve as the sole means of instruction.

B. MASSED VERSUS DISTRIBUTED PRESENTATION

Project No. 9. "Relative Effectiveness of Massed Versus Distributed Film Presentations."

Massed and distributed film presentations were employed in two situations: with college students, and with naval trainees. The films used with the college students were the "Cat Neurosis," and the "Ape and the Child," series. Those used with the naval trainees were from the "Rules of the Nautical Road" and "Hydraulics" series. To various initially equated college groups the films were presented in either a one-hour showing, two thirty-minute showings, or four fifteen-minute showings. For the equated Navy groups the films were shown in one forty-five minute showing or three fifteen minute showings. Learning was measured with achievement tests at the completion of the series, and after intervals of from one to two weeks. Control groups were obtained by testing subjects who did not see any of the films.

That learning resulted from the film presentations is evidenced by superiority of the experimental groups over the control groups. However, only small and insignificant differences in learning resulted among the experimental groups of both Naval and college populations, indicating no advantage for either massing or distributing film presentations. As much learning resulted when the material was presented in a single hour as when it was divided and shown in smaller quantities.

C. MULTIPLE SHOWINGS OF FILMS

Project No. 24. "Effects of Repetitive Presentation on Rate and Amount of Learning." (see p.35)

In this study the four science films previously mentioned will be shown to equated groups of college students. Each film is being shown to various groups, once, twice, three times, or four times. The repetitive showings of a film come in immediate succession.

A determination will be possible for each film, of its relative effectiveness when shown once, or with various degrees of repetition.

Project No. 13. "The Effects of Inserted Questions and Statements on Film Learning." (see p.28)

Films altered by insertion of Questions (which were answered and checked by the learners) and Statements, were shown to be conducive to somewhat greater learning than a single showing of the original, unaltered films. However, the simple and inexpensive procedure of showing the original, unaltered films twice in immediate succession, gave results which were only slightly below the best results obtained with the various "Question" and "Statement" versions.

V. THE AREA OF REVIEWS OF PERTINENT LITERATURE AND THEORETICAL SYSTEMS

Project No. 4. "Critical Evaluation and Summary of Experimental Literature on Instructional Films." In preparation.

Project No. 5. "Critical Evaluation and Summary of Learning Theories in Psychology and Education Pertinent to Instructional Motion Pictures." In Preparation.

Project No. 8. "Annotated Bibliography on Effectiveness of Music in Instructional Films." Completed.

Project No. 18. "Research Literature on Commentaries." In preparation.

Project No. 31. "A Report on Instructional Film Research, Production and Utilization in Great Britain, Canada, and Australia." Completed.

Project No. 45. "Summary Report on Instructional Film Research, Production and Utilization in the United States." In preparation.

Project No. 16. "Filmic Illustrations of Selected Learning Principles Applicable in Instructional Films."

The purpose of this project is to assemble from existing films, and to produce where necessary, illustrations of selected, established learning principles in films. The outcome will be a film or series of films showing applications in the motion picture medium of learning principles derived either from experimental work on learning in general, or from experimentation on learning from films. It is believed that such a motion picture will be a valuable supplement to written reports in communicating information to those interested in film production and utilization. A review of the experimental literature of learning, and of numerous films judged in a survey to contain effective teaching sequences is in progress.

Project No. 37. "A Theoretical System and other Requirements for Research in 'Mass Media' (sound films, radio, and television)."

A part of the work of Project 16 (see above) was the review and analysis of research literature on the problem of learning; general statements of learning principles were gathered, and others derived from research studies. In addition a listing of important variables in motion pictures which might seem to be related to their instructional effectiveness was made. These comprise Parts I and II of "A Classification of Some Areas for Research on Instructional Films."

The function of the present project is to attempt to extend systematically this material, and any new findings arising from research on motion pictures, to the fields of radio and television.

A SKELETON CLASSIFICATION OF SOME AREAS FOR RESEARCH ON INSTRUCTIONAL FILMS

This is included for the convenience of the reader in following the more detailed content of the body of the foregoing report. It is bound in such a manner that it may be folded out and kept in view while other pages are being read.

Headings (which indicate areas for research) are followed by the numbers, in parentheses, of those particular projects which deal with them. Some projects deal with more than one heading and therefore appear several times.

SOME AREAS FOR RESEARCH ON INSTRUCTIONAL FILMS

I. Learning Principles

A. MOTIVATIONS AND INCENTIVES

1. EFFECTIVENESS OF GOALS
2. KNOWLEDGE OF PROGRESS
3. PRAISE AND REPROOF
4. SUGGESTION
5. REALISM AND PRACTICABILITY(14)(20)(35)
6. ANTICIPATION OF EARLY USE
7. EXAMINATION SET
8. CHALLENGE

B. SELF ACTIVITY

1. MENTAL PRACTICE
   - a. Verbalizing task
   - b. Visualizing task
   - c. "Feeling" task
2. RAISING AND ANSWERING QUESTIONS(13)
3. LEARNER PROTAGONIST(33)(14)

C. SEEING-ORGANIZING RELATIONSHIPS

1. MEANINGFULNESS
   - a. Meaningfulness (generally)
     - (1) Use of simple words
     - (2) Relating past to present
     - (3) Preliminary overview(17)
     - (4) Learner position(14)
     - (5) Emphasis on details(10)(12)(19)
     - (6) Reasons "why?"
     - (7) How it works(10)(44)
     - (8) Reviews and summaries(17)
   - b. Meaningfulness (in case of concepts)
     - (1) Varied experiences
     - (2) Simplified symbols
     - (3) Personalization
     - (4) Contrasts and similarities
2. PATTERNING
   - a. Functional
   - b. Spatial
   - c. Temporal(19)
   - d. Logical(10)
3. IDENTIFIABILITY(6)(14)(20)

D. PRINCIPLE OF EFFECT

1. CHECKING OR "OK" BY LEARNER(13)
2. DEMONSTRATION OF WRONG METHOD(10)(29)

E. PRACTICE AND REPEATED PRESENTATION

1. EXERCISE UNDER FAVORABLE CONDITIONS
2. OVERLEARNING(10)(13)(24)
3. REALISTIC PRACTICE(14)
4. PART-WHOLE PRACTICE
5. SPACED PRACTICE
6. MINIMUM DELAY OF PRACTICE(14)
7. REVIEWS(17)

F. GENERALIZATION

1. GENERALIZATION SET
2. RECOGNIZED SIMILARITY

G. CHARACTERISTICS OF LEARNER

1. GENERAL MENTAL ABILITY(21)
2. EDUCATIONAL LEVEL
3. KNOWLEDGE OR SKILL
4. SPECIAL APTITUDES(21)
5. LEARNING THROUGH EYE OR EAR (6)(32)
6. ATTITUDES AND INTERESTS(25)(33)
7. EXPERIENCE WITH TEACHING TECHNIQUES (30)

II. Film Characteristics

- A. COLOR(6)
- B. MUSIC(7)
- C. EMPHASIZERS(22)
- D. VOICE CHARACTERISTICS
- E. MULTIPLE SENSORY PRESENTATION(32)
- F. ESTHETIC QUALITIES
- G. EMOTIONAL TONE
- H. DRAMATIC VS. FACTUAL(28)
- I. HUMOR
- J. PERSONALIZED COMMENTATOR
- K. UNITS CLEARLY MARKED OFF
- L. PACING AND RATE OF DEVELOPMENT(10)
- M. VERBALIZATION CHARACTERISTICS (10)(19)(44)
- N. TIME RELATION: SOUND AND PICTURE(19)
- O. FACT FREQUENCY AND FILM LENGTH(12)
- P. ANIMATION
- Q. MODIFIED MOTION
- R. CAMERA VIEWPOINT AND PERSPECTIVE (14)

III. Development of New Research Equipment and Procedures

(2)(3)(23)(27)(34)(38)(39)(40)(41)(42)(26)(33)

IV. Utilization of Films in Instruction

(9)(13)(15)(24)

V. Reviews of Pertinent Literature

(4)(5)(8)(16)(18)(31)(37)(45)